

AGENDA:

1. Introduction to BIM Concepts
2. Introduction to Revit Concepts
3. Exploring the Parts of the Revit Interface
4. Revit Interface Basics

1. Introduction to BIM Concepts

BIM or Building Information Modeling is a new and revolutionary approach to the design and documentation of buildings. BIM allows you to manage the information related to a building through the entire life of the building design, from early conceptual designs, through to detailed construction documentation, and even beyond the construction phase to facilities management throughout the life of the actual building.

The “information” in Building Information Modeling refers to all of the input that goes into the building design including things like materials, wall construction, the number and type of doors, floor areas and usage patterns, energy analysis, quantity takeoffs and even cost estimates. All of this information is contained in an intelligent 3-dimensional model of the building that can be viewed in a variety of ways and outputted to fully coordinated construction documents.

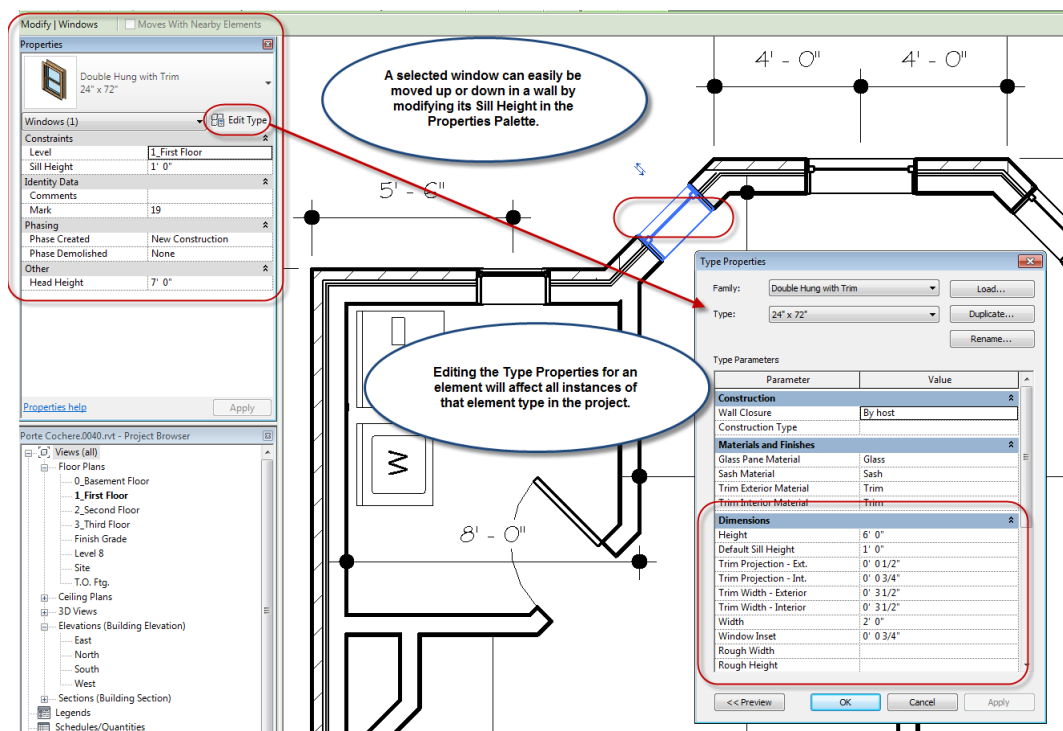
There are many advantages to working with a BIM approach. Probably the most significant benefit is that developing a single building model as the basis for all related construction documents ensures coordination between different views of a model. When you delete a window in a plan view, this change will automatically be applied to the elevation view. The window schedule will also be updated at the same time. Any changes made to the model, in any of its views will seamlessly and automatically be propagated to all other related views.

Other benefits to working within a BIM approach include: a better understanding of the building and its spaces by being able to easily view the model in 3D, fewer errors in cross-referencing views and details, interference checking for conflicts among various structural, mechanical and architectural elements, automated schedules, and quantity takeoffs.

2. Introduction to Revit Concepts

Revit is the newest and most technologically advanced BIM application currently available. Revit software now encompasses the full spectrum of industries required to bring a building design to fruition with support for Architectural, Structural, and MEP, (mechanical, electrical, plumbing) disciplines.

Revit was designed from the ground up specifically to address the requirements of the BIM industry development. The name Revit was derived by the original developers from the term “Revise Instantly” and from the beginning, this platform was designed to be able to manage changes in the design of a building.

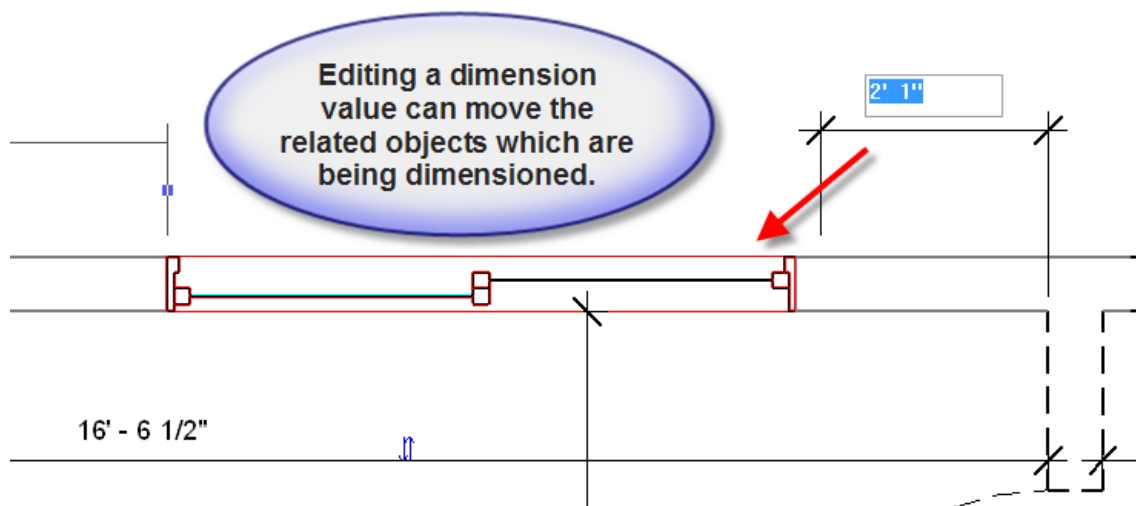


Revit uses Parametric Objects and Parametric Relationships to help accommodate the inevitable changes that need to be executed when developing a model. A parametric object is an intelligent object that can have various sizes, materials, or other parameters assigned to it. These parameters can be accessed and modified through a dialog box allowing you to quickly and easily create variations on a single object. A desk could have parameters such as length and width that could easily be modified without affecting the height of the object.

Parametric objects are a common feature in many modern software packages but Revit extends the power of parametrics by allowing you to create intelligent relationships between objects. A floor, for example can be attached to a set of walls which encompass the floor. When you move a wall to resize the structure, the floor will also automatically resize to follow the new shape of the surrounding walls.

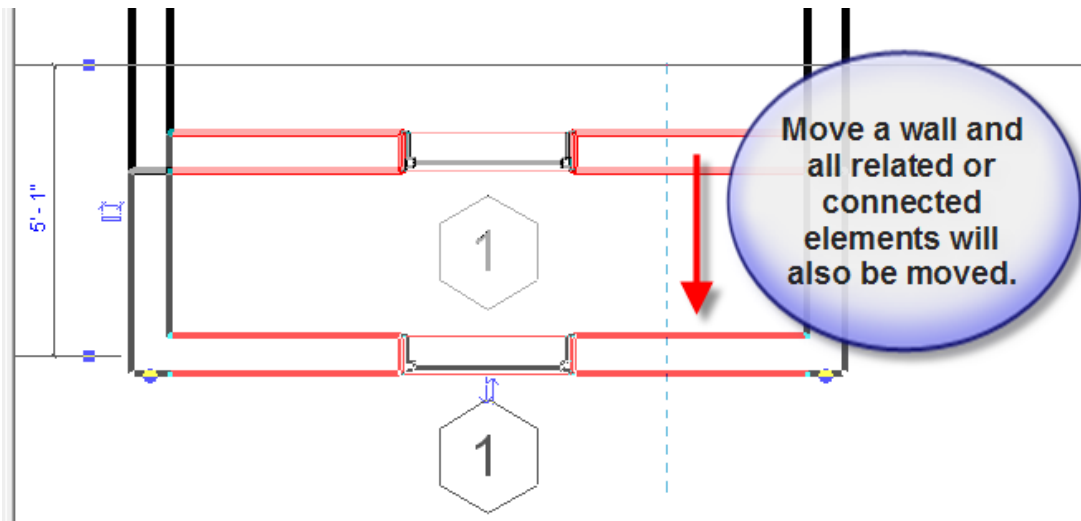
Many elements such as walls, floors, roofs, etc. are constrained to levels or critical heights defined in your building such as the height of the floor above grade and the height of the ceiling above the floor. If you change the floor to ceiling height by moving one of the levels, all elements that are related to that level will automatically be adjusted.

In a regular CAD drawing, changing the position of an element such as a window by stretching it, will also update any associated dimensions. In Revit, this is also true, but it is taken a step further as you can select any dimensioned element such as a door or wall, and its dimension values will be highlighted. Modifying the dimension value will actually modify the position or size of the dimensioned element. Dimensions are not only associative as in regular CAD, but are truly parametric, being able to drive the design.



Annotation and Sheet management is also fully parametric in Revit. Tags and detail notes are linked to objects and to the sheets on which views are placed. If you change a sheet number, all details on that sheet will automatically be renamed and renumbered in all other related views.

Revit creates logical relationships between elements such as connected walls or windows within a wall. If you delete a wall, any elements hosted by that wall such as doors or windows will automatically be deleted as well. If you move a wall by picking and dragging it, not only will its hosted elements such as doors and windows move with the wall, but any other walls which are connected to the wall being moved will also be resized to maintain the connections or Joins between those wall.



Additional User-Defined rules may also be created to maintain dimensions or relationships between elements in your model. For example you might wish to define a window as being placed in the middle of a gable wall. If the wall changes width, the window will automatically be moved to maintain the Equal distance of wall on either side. This can be accomplished with an Equal dimension constraint.

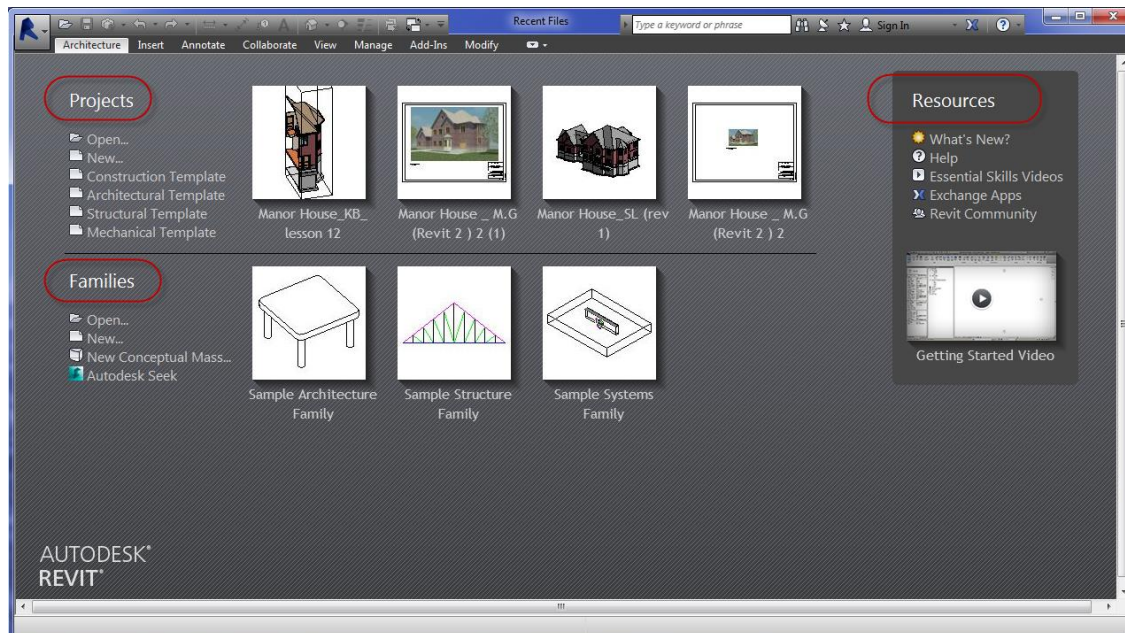
Objects may be locked to other objects with alignment Padlock constraints. For example, one edge of a stair may be locked to a wall such that if you move the wall, the stair will be moved along with it or vice versa. Elements may also be locked to prevent unintended edits.

It is worth noting that although it is easy to create constraints between elements and lock them together, it is recommended to keep the number of constraints and locks to a minimum. Consider locks and constraints to be a temporary measure to aid in the design process. Add the constraint or lock but then remove it after the elements have been positioned correctly.

Too many constraints can make a project difficult to edit and will increase file sizes dramatically.

3. Exploring the Parts of the Revit Interface

When you first open Revit, a Recent Files window will appear with three main sections – Projects, Families, and Resources.

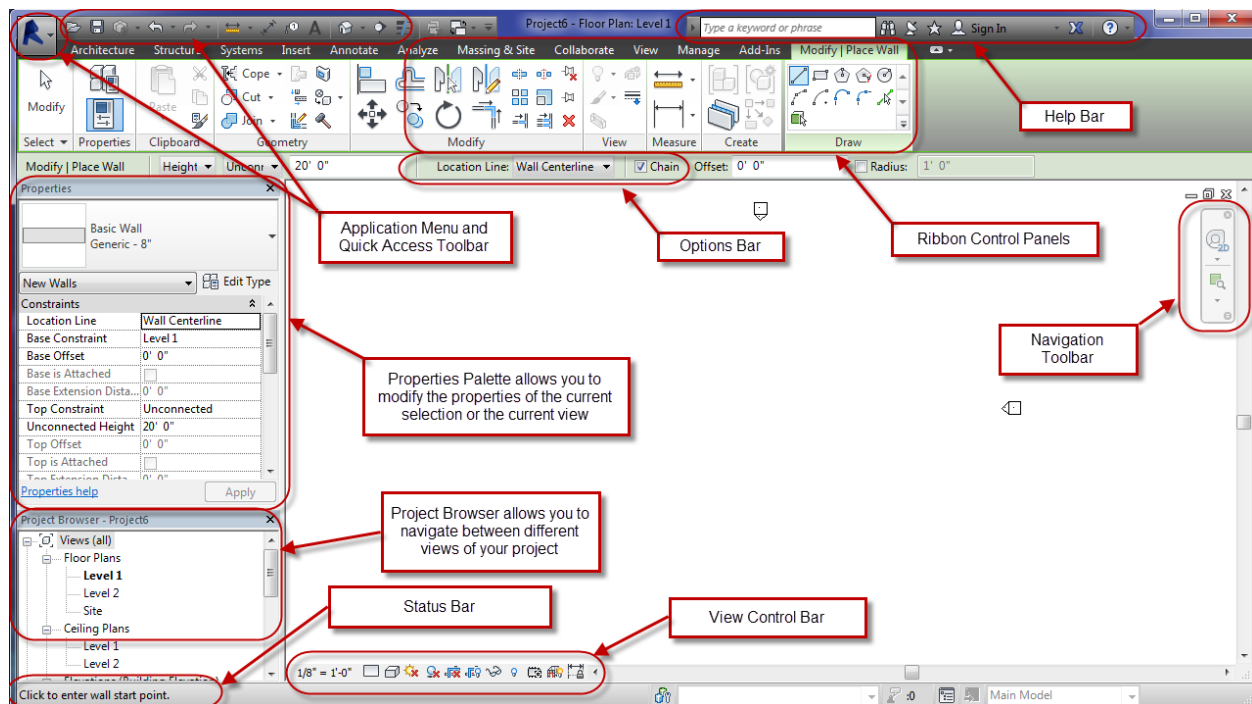


Projects are the main file type and format for working in Revit. The Projects section shows the four most recently accessed project files with thumbnail images for each. There are Open and New links as well as links to the four main project template files for different disciplines – Construction, Architectural, Structural, and Mechanical.

Different templates will contain numerous settings such as starting views, measurement settings, and project phasing as well as preloaded content. In this course, you should start your projects with the Architectural template. This will use the “Default.rte” template from the US Imperial templates folder.

If you pick New, you will be shown a dialog box with a browse option that will allow you to find any template file including those with a different system of measurement. When you install Revit, the initial templates and measurement system are assigned based on your location. You can modify this information by accessing the Content library options in your Windows Control Panel.

When you start a new project in Revit you will see an interface with a large drawing area and several areas for accessing commands, setting options and parameters, and controlling the view of your drawing or model.



It is possible to modify the appearance of the interface by opening or closing interface elements via the User Interface pulldown on the Windows panel of the Ribbon's View tab. You may drag the Project Browser or Element Properties palettes to a new position or float them in front of the drawing area. You may also toggle the display of the Ribbon control panels by selecting the minimize options at the right side of the tabs.

The Structure and Systems tabs on the Ribbon may be turned off when working with the Architectural portion of a project by accessing the User Interface section of the Options dialog.

Revit has excellent support for keyboard shortcuts which are widely used to speed access to commonly used commands. The tooltips display the 2-key shortcut for all commands that have shortcuts defined. Example – Wall = WA and Door = DR.. Type KS to open the keyboard shortcuts dialog box where you can view, create, and modify all shortcuts.

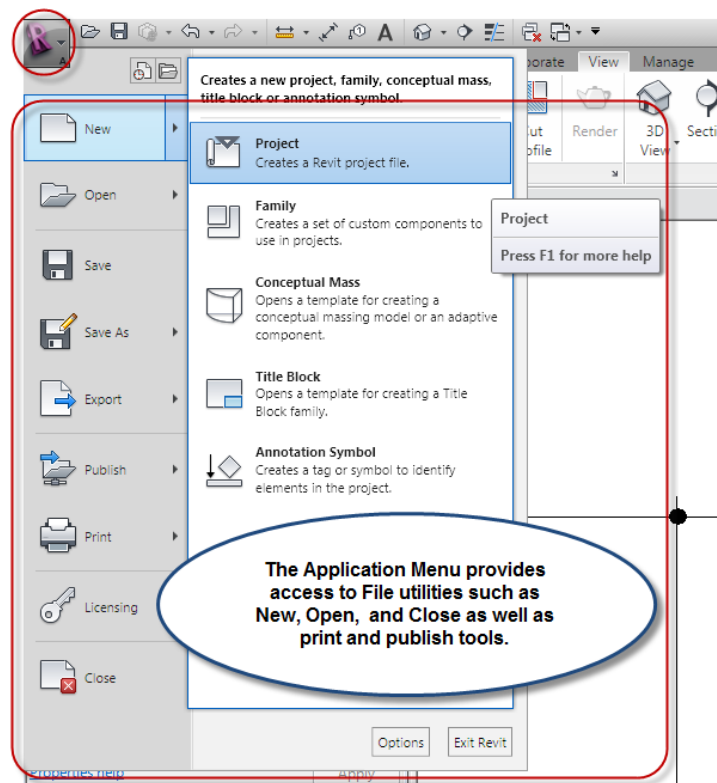
Title Bar

The title bar at the top of the screen displays the version of software, the name of the current project and also the current view name. At the right end of the title bar you will find a set of help options including a search field which allows you to type in a search query for any topic.

Application Menu

The Application Menu is accessed by selecting the large letter R in the upper left corner of the screen. This dropdown menu allows you to start new files, open existing files, close files, export the current project, print or publish the project, and access program options and license information.

Pick Options from the Application menu to open the main options dialog for Revit. The options dialog has sections for specifying the default file locations, save reminder intervals, view and navigation behaviors, spellchecking options and much more.

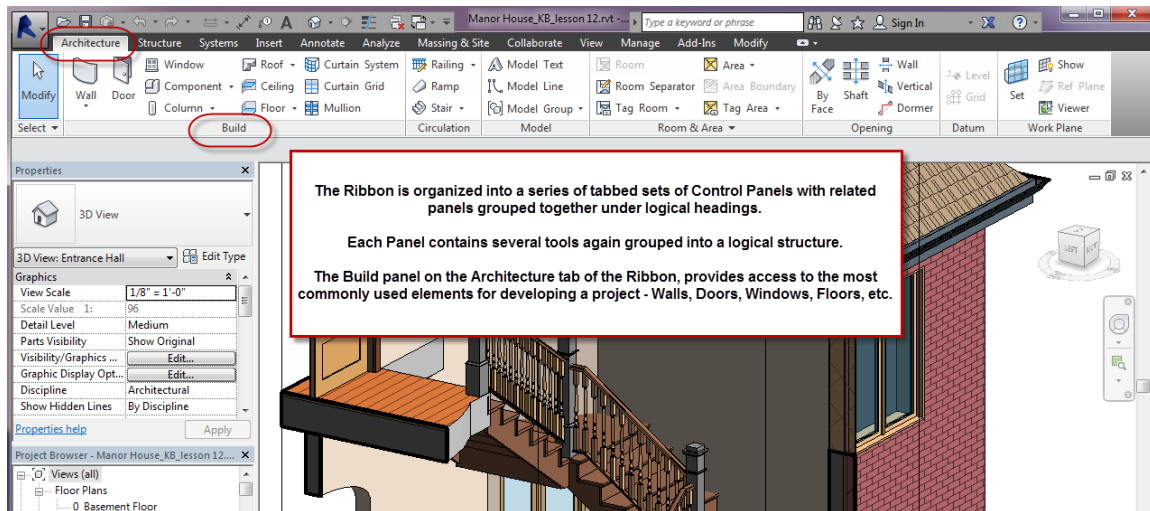


Quick Access Toolbar

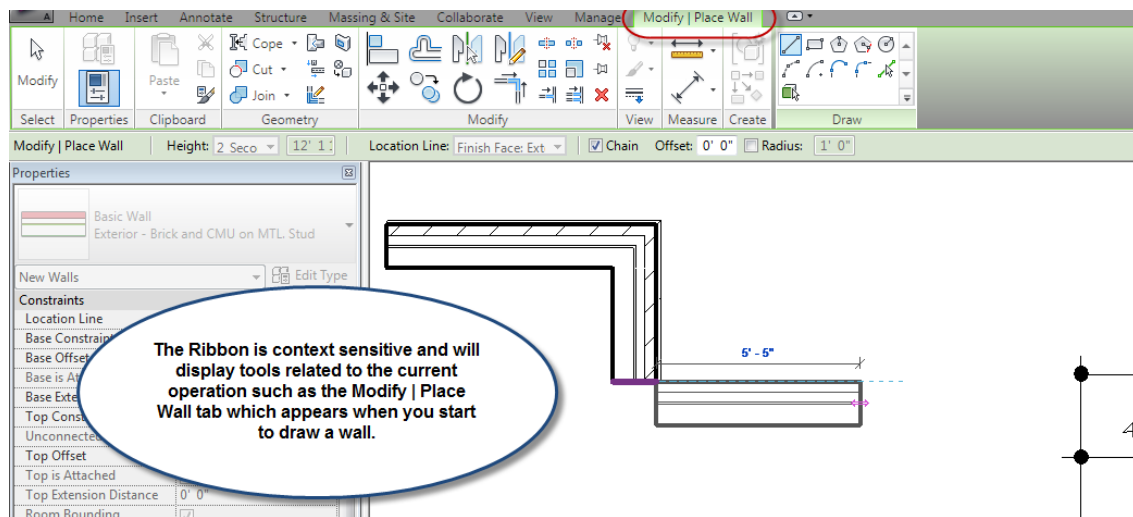
The Quick Access toolbar located to the right of the Application menu provides access to many of the most commonly used commands such as Undo and Redo, File utilities, Dimension tools, Text tools, and 3D viewing options. The Quick Access toolbar is easily modified by selecting elements to include on the toolbar from a dropdown list accessed via the arrow pulldown at the right end of the toolbar.

Ribbon Control Panels

The Ribbon is the main interface element used for accessing tools in current versions of Revit. The Ribbon contains 9-12 default tabs and each tab has a corresponding set of control panels which may be displayed by picking that tab and setting it current.



The Ribbon is a context sensitive interface element and its contents will vary with the currently selected tool or element. If you select a Door tool from the Build panel on the Home tab of the Ribbon, a new tab will appear called "Modify | Place Door". These context sensitive tabs also appear when you select an existing element so if you pick an existing window, a tab will appear called "Modify Window".

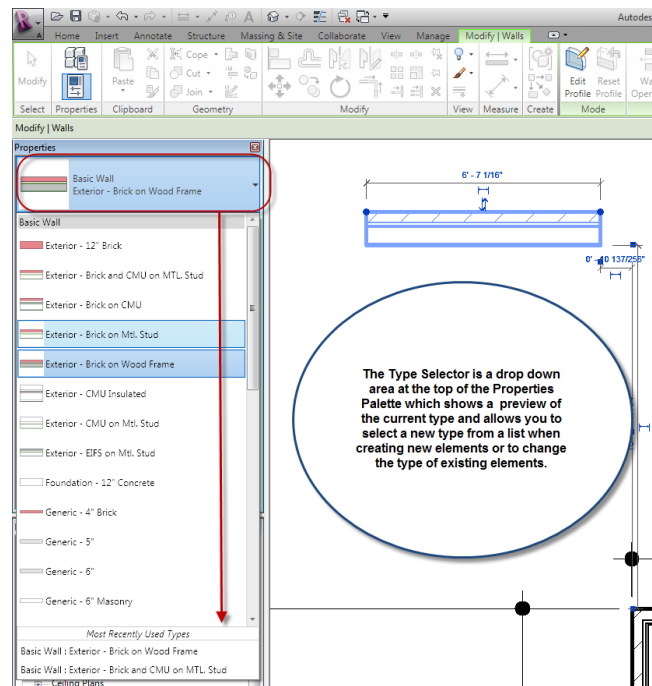


Type Selector

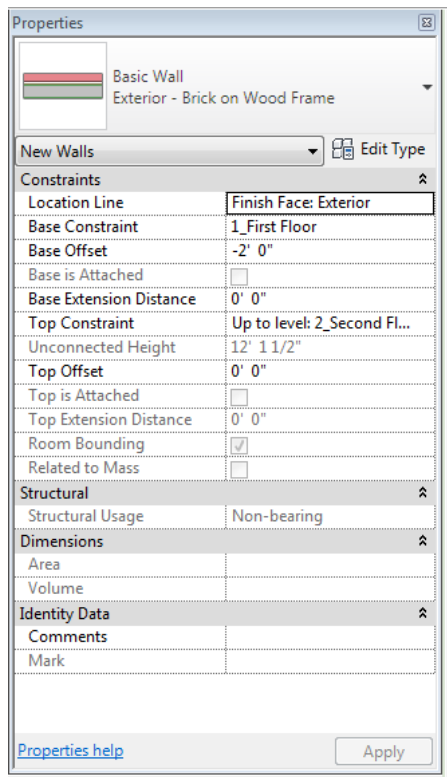
The Type Selector is a dropdown list of available variations for an element. The content will vary with the selected element.

If you select any element in Revit, its specific type will be displayed in the Type Selector window.

The Type Selector may be used to set the type for an element when it is being created or to change the type for one or more selected elements.



Properties Palette



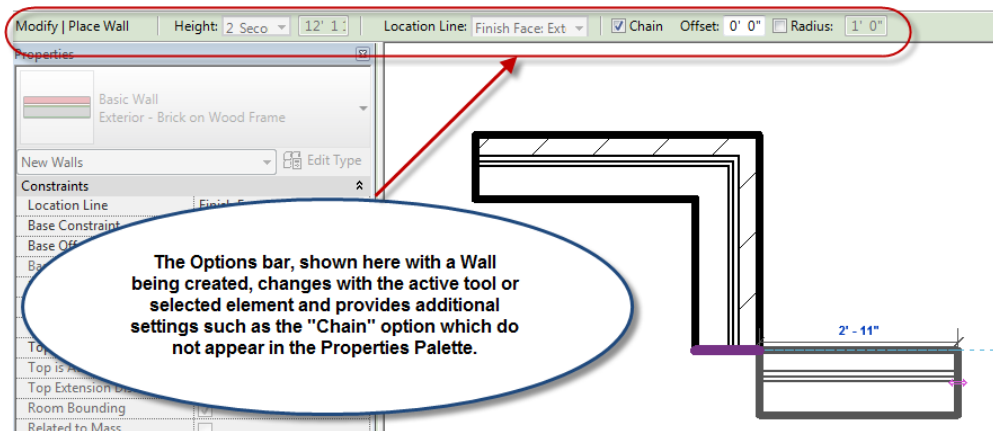
The Properties palette is one of the most important interface elements. It allows you to set all instance parameters for any object as it is being created. Pick any object creation tool, pick the element type, set the element properties, and then continue to create the element.

The Properties Palette also allows you to modify the properties for a selection set of existing objects. The Properties palette is context sensitive and will display only settings and parameters which are applicable to the object being created or which are common to the current selection set.

The Properties palette displays the settings for the current view such as scale, detail level, etc. when no objects are selected and no object creation tool is active.

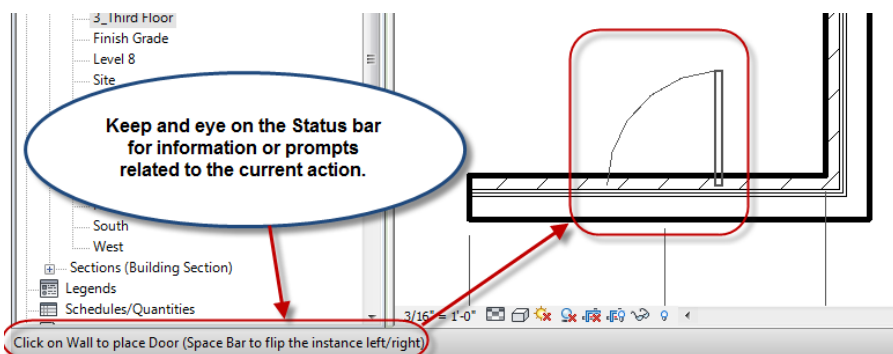
Options Bar

The Options Bar will change dynamically depending on the type of element which is selected or is being created. It allows you to change the behavior of the object creation and/ or the parameters for the object.



Status Bar

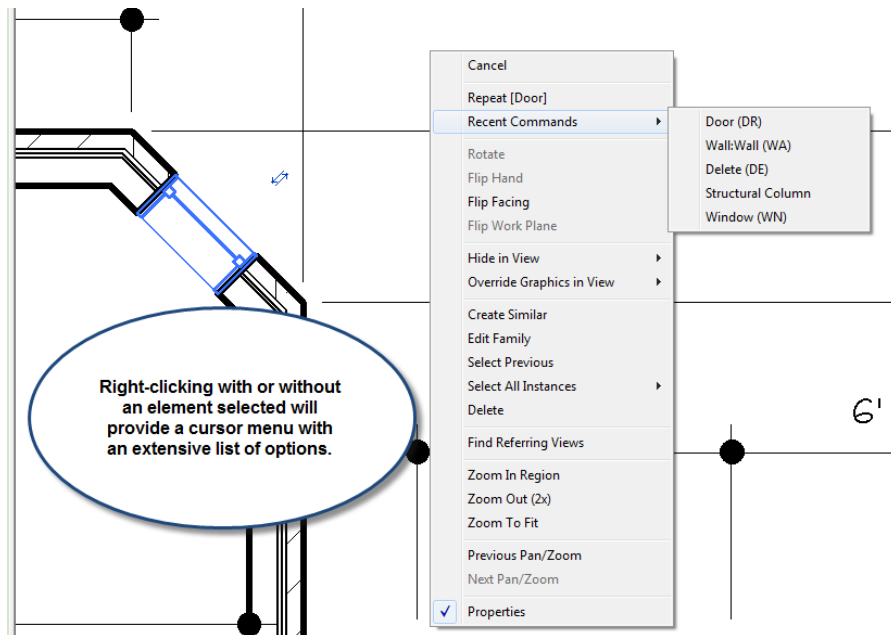
The Status Bar at the bottom of the application window will display information relevant to the current command or operation and is similar to the command window in AutoCAD. Start a wall, and the status bar will prompt you to pick a start point. Start a door command and the status bar will prompt you to select a wall to which you will add the door.



If you mouse over an element in the drawing area such as a door or wall, it will show a description of the element type. This will also work with one or more objects in the active selection set.

Shortcut Menus

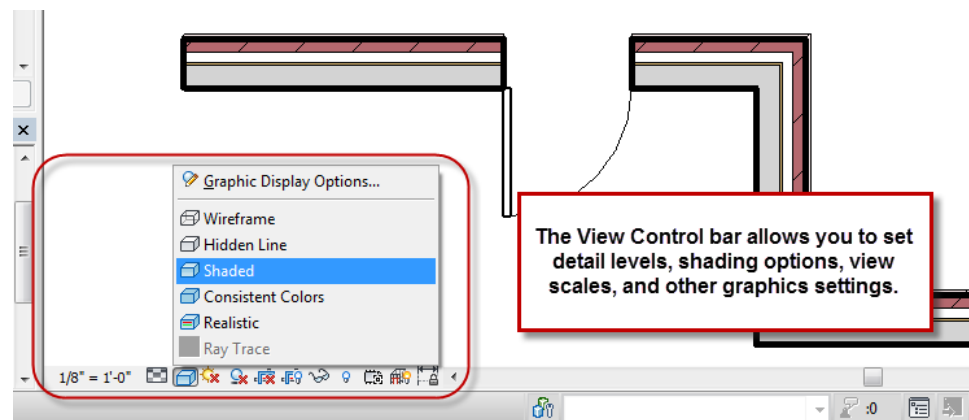
Right clicking in the drawing area or over a selected element will provide quick access to many common commands that are applicable to the current selection.



The cursor menu also provides access to zoom and pan commands, options to create a duplicate of a selected element, and to a list of recent commands.

View Control Bar

The View Control Bar just above the Status Bar provides access to several common functions that will modify the appearance of the contents of the drawing area.



Project Browser

The Project Browser shows a logical hierarchy of all Views, Legends, Schedules, Sheets, Families, Groups, and linked Revit models for the current project.

The major categories above can be expanded or collapsed by selecting the arrow by the category name.

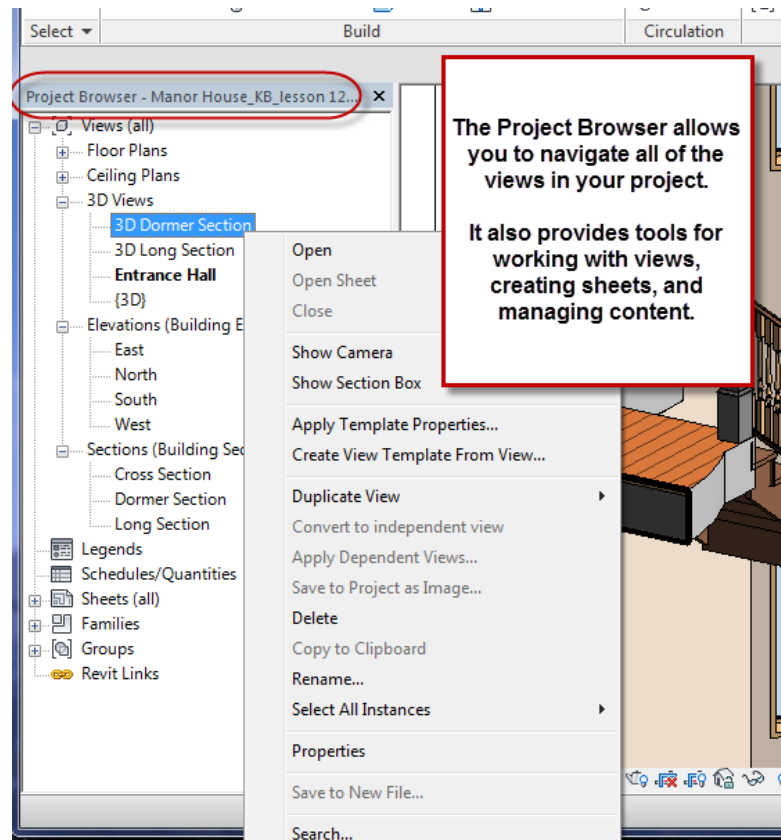
Selecting an entry in the Project Browser and then right-clicking will display a context sensitive set of commands or options which you can apply to that selection.

To select more than one object in the browser at the same time, use the standard Windows selection functions by pressing and holding the CTRL or SHIFT keys while picking entries.

The most common use for the Project Browser, especially for the beginning user, is to use the View category to switch between views. To make a view active, you can either right-click over the view and choose Open, or simply Double-click the view name to bring it to the front and set it as the active view.

Each time you open a view, it remains open when you switch to another view. All open views are listed in the Switch Windows pulldown menu on the Quick Access toolbar and it is a good idea to periodically check this list to ensure you don't have too many windows open at one time.

Other common view options include Renaming, Deleting, and Duplicating Views, all of which can be accomplished from the context menu.



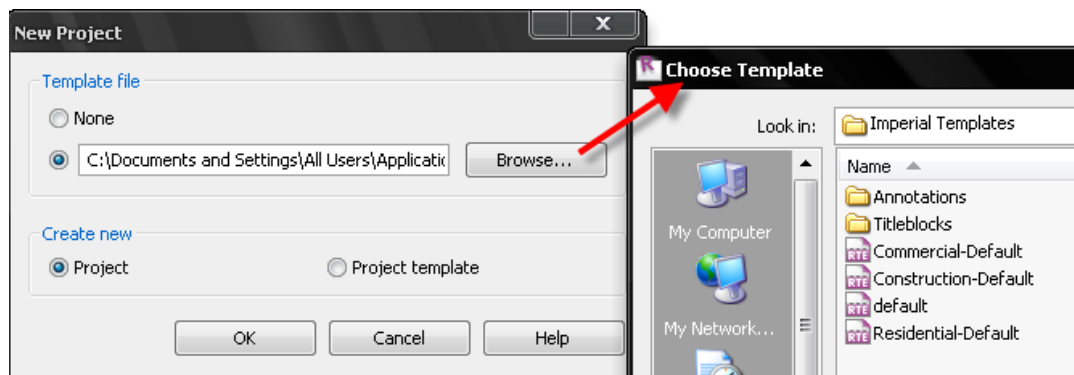
4. Working with the Revit Interface Basics

Starting a New Project

A Project is the database of information for your design or Building Information Model. The project file contains all of the information required to describe and document your building. As the design progresses you will create as many views as are required to document the design. When you make a change in any view, all related views will update.

When you first start Revit, the recent files window will appear, showing you the four most recent projects you have worked on. You may open one of these files or you can pick the Open button at the left side find another project to open.

To create a new Project, choose the *New* button at the left side of the Recent files list or from the application menu, choose *New / Project*. The latter method will open the New Project dialog where you can select your desired template. Revit includes several template projects for different systems of measure and also for different uses such as Residential or Commercial. Selecting the Browse button allows you to find the correct template for your intended design.



If you start a new project by choosing the New Project tool icon on the quick access toolbar, Revit will also display the New Project dialog box shown above.

Selecting the None option will allow you to start a file with either metric or imperial units, no component families loaded and only a single Floor Plan and Ceiling Plan for views.

Element Creation Basics

Buildings are created by adding elements. There are three distinct types of elements in Revit: *Model Elements, Datum Elements and View Specific Elements.*

Model Elements

Model Elements are all of the physical components that define the building including walls, floors, roofs, doors, etc. There are two types of Model elements – *Host Elements* include all of the major building components which are usually constructed on site. *Model components* are all of the other types of elements in the building model which are usually brought in and installed such as Doors, Windows, Plumbing Fixtures, etc.

Datum Elements

Datum elements define the context and critical locations for the building project and include Grids, Levels and Reference Planes.

View Specific Elements

View Specific elements only appear in the views in which they are placed. They serve to describe and document the model and include things like Dimensions, Tags, and Notes. There are two types of view-specific elements – Annotation elements such as dimensions and keynotes; and Detail elements such as lines, filled regions, and 2D detail components which provide more detail about a particular area in the building.

To create an object in Revit, choose the element category from the Ribbon or quick access toolbar, select the element type in the Type Selector, choose appropriate options on the Options bar, and then select points or host elements in the drawing area.

Some objects must be hosted and cannot be placed directly in the drawing. For example a door cannot exist as a free standing element and must be placed in a wall. The Status bar will always display information regarding the object being created and what Revit is expecting from you.

Entering Coordinates and Temporary Dimensions

When drawing lines or walls, special dimensions will appear showing you the current length of the element being created. If you type a value and hit enter, the line or wall will be drawn that length. If you are working in metric, the number you type will be in millimeters. If you are working in Imperial system and are using Feet and Inches, the number will represent Feet, not inches. To enter feet and inches, you can use the ' symbol to represent Feet and the " symbol to represent inches. You can also use a space between two numbers to represent feet and inches. A second space after the inches would allow you to also include a fraction.

1. Example 1 – To enter 48 feet and 8 inches you could type either **48'8** or **48 8**
2. Example 2 – To enter 9 and one half inches you could type **0'9 ½** or **0 9 ½**
3. Example 3 – To enter 6 inches you would type **0 6** or **6"**

When adding model components or when you select existing components, Revit will display temporary dimensions around the components, allowing you to easily position the component in the correct place relative to surrounding elements.

Temporary dimensions are placed in accordance with the settings defined in the Temporary Dimension Properties dialog. (Additional Settings pulldown on Manage tab of the Ribbon). These settings determine whether a temporary dimension will be drawn to the centre of an object or to one side of the object.

To move a temporary dimension's witness line, you can pick the blue box on the extension line or right click the blue box and choose Move Witness Line.

Use temporary dimensions to move objects into the correct position, by selecting the element, modifying the witness lines if necessary, and then picking the blue text to edit the value as required.

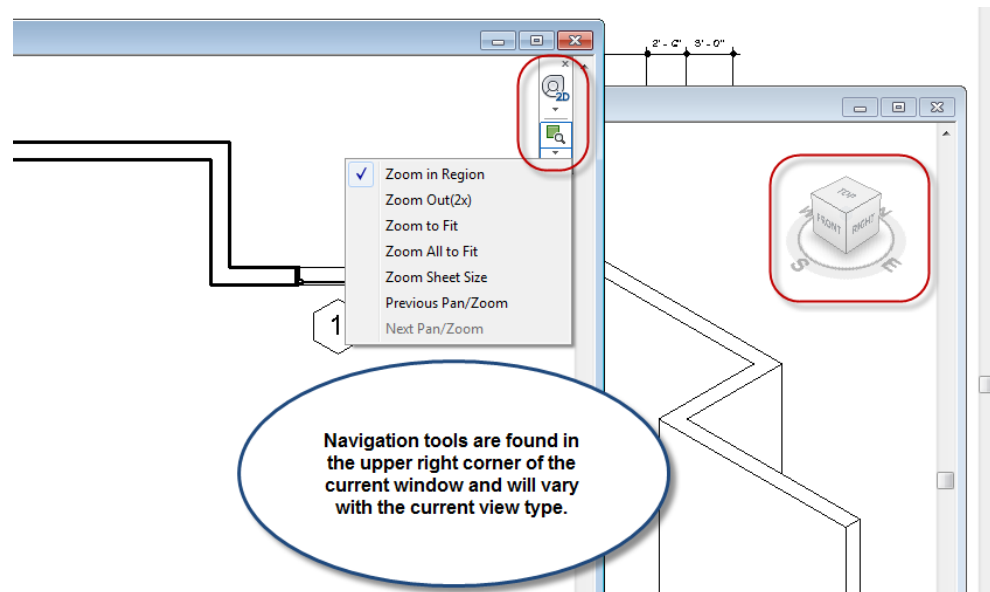
By default, temporary dimensions are only shown for the last selected object. It is possible to display temporary dims for multiple objects by selecting them and then choosing Activate Dimensions from the Options Bar. Note that displaying multiple sets of temporary dimensions at one time can decrease software performance.

Navigation

Navigation techniques within the Revit drawing area are similar to those found in other Autodesk applications. The fastest way to enlarge or reduce the size of the current view is to use the wheel on your mouse. Move the cursor over the area you wish to zoom on and turn the wheel forward to zoom in and backward to zoom out.

To zoom in on a rectangular area (similar to defining a Zoom Window in AutoCAD), use the Zoom Region option available from the Navigation Bar in the upper right corner, or by typing ZR and then picking two points to define the region to which you wish to zoom.

Pressing and holding the middle mouse button will activate the Pan command. Clicking and dragging with the middle button will Pan the view in the direction you drag your mouse.



To create a 3D view of your model or to switch to the current 3D view, select the Default 3D View icon from the Quick Access toolbar or the Create panel on the View tab of the Ribbon.

If a 3D view is active, you can rotate your viewing direction about the model by holding the Shift key while pressing the middle button and dragging your mouse.

When a 3D View is active, the view can also be modified in a number of different ways utilizing the View Cube or Steering Wheel controls which may be found on the Navigation toolbar.

Object Selection

To select a single object, move your cursor over the element and pick with your left mouse button.

When you move your mouse over an object it will highlight. If several elements are close together, move your mouse over them and then press TAB to highlight the objects one at a time. When the desired object is highlighted, pick to select it. You can also select an element with your right mouse button and it will display a context sensitive cursor menu at the same time.

To add items to a selection set, press CTRL and click additional elements. To remove items from a selection set, press SHIFT and click selected items. To select a series of connected elements such as end connected walls, move your mouse over one of the elements, press Tab to highlight all of the connected elements, and then pick to make the selection.

To select several items at once, click and drag to create a rectangular selection box. If you define the box from left to right it will only select objects that are entirely inside the selection box (selection window). If you choose the points from right to left it will select all objects that are partially encompassed by the selection window as well as those that are entirely within its boundary (selection crossing).

To select all instances of one type, for example all of the interior partition walls in a floor plan, pick one wall and then right click and choose Select All Instances. You can also pick the element and then type SA to select all instances. If you select an element type in the Project Browser and right-click, you will also find the option to Select All Instances.

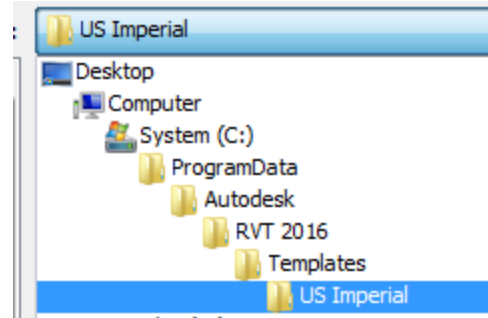
To restore a previous selection, press the CTRL key and the left arrow on your keyboard or right click anywhere in the drawing area and choose Select Previous from the cursor menu.

Whenever you select multiple elements, a filter icon appears on the Selection panel on the Ribbon. To create a filtered selection from a selection set of different elements, choose the Filter icon and then place checkmarks beside the categories to include in the selection. It may be helpful to use the Check None button to clear the list first if you only want to select items from a few categories or a single category. The Selection panel also provides options to save a selection set with a name and then restore that selection later with the Load selection option.

Exercise Notes

In the following exercise you will start a new Project with Revit, learn how to use the interface, and experiment with creating a simple building using basic walls, windows, doors and a roof.

1. Start Revit and from the recent files window, choose New / Project. In the new Project dialog choose browse and select the default Imperial template at
 C:\ProgramData\Autodesk\RVT 2016\Templates\US Imperial \default.rte
 - a. Note - The path shown here is for Windows 7 installations. If you are using a different operating system such as Vista, the path may vary.
2. Look in the project browser and confirm that Level 1 is shown in **Bold** indicating that it is the current level. In the drawing area you should see four elevation tags with arrows pointing in to the location of the building you are about to create.
3. From the Build panel on the Architecture tab of the Ribbon, pick the Wall tool. In the Type Selector, at the top of the Properties palette, choose Basic Wall: Exterior – Brick and CMU on Metal Stud. On the Options bar, set the Height to Unconnected and 10' 0". (Highlight the field by picking, type 10 and hit enter). In the Location Line dropdown list, choose Finish Face: Exterior. Confirm that the Chain option is selected.
4. Pick a point in the lower left section, between the elevation tags and drag your mouse up to start drawing a wall. You will see two dimensions showing the length of the wall and its angle with horizontal axis. The wall will snap to a vertical axis and display both a tooltip and a dashed line indicating its orientation. Type 38 and hit enter to draw a 38 foot wall.
5. Drag your mouse to the right until you see the dashed line appear with a Horizontal and Extension tooltip. Instead of specifying the distance, just drag your mouse until the temporary dimension reads approximately 50 feet and pick a point. Drag your mouse down approximately the length of the first wall, and another tracking line will appear indicating a perfect alignment with the first wall. Pick a point to complete the third wall.



6. Drag your mouse to the left, then up, then left, then down, then left to connect to the starting point of the first wall and create a recessed section around the middle of the south wall. Don't worry about the distances, but do try to keep the walls vertical and horizontal.
7. When you have closed the perimeter of the wall, hit the ESC key once to end the chain. The wall command is still active. To one side of the building, create an L shape with two wall segments. Hit ESC again and then repeat to create another pair of walls. Hit ESC once to stop the current chain of walls. Look at the Ribbon where the Modify | Place Wall tab is still active and hit ESC a second time to end the Wall command and the Modify command will highlight. To cancel an active command hit ESC twice or just reach over and pick Modify.
8. Drag a rectangular selection window around the extra walls outside the building perimeter. Just pick one corner, drag your mouse and let go. The walls will turn blue indicating they are selected. Pick one of the building walls. Pick one of the extra walls. Each time you pick a wall, the previous selection is cleared. Press CTRL and pick the walls outside the building one at a time to add them to the selection set. Add and two of the building walls to the selection set as well. Press the SHIFT key and pick the highlighted building walls to remove them from the selection set. When only the four extra walls are highlighted, press the Delete key to remove them from the project.
9. Type ZR and pick two diagonal points to define a Zoom Region around the building. Type ZF to Zoom to Fit. Experiment with using your mouse wheel to zoom in and out. Note that the zooming will be centered wherever you place your cursor as you turn the wheel.
10. Try panning the view by pressing and holding the middle mouse button and dragging your mouse. Type ZA to Zoom All. (ZA and ZF do the same thing). Zoom in one more time and then double-click your middle mouse button to Zoom Fit again.

11. From the Build panel on the Architecture tab of the Ribbon, pick Door and in the Type Selector choose Single-Flush: 36"x84". Select the "Tag on Placement" option on the Ribbon. Move your cursor over the recessed wall along the bottom of the plan. Look at the status bar in the lower left corner to view the prompt to "click on wall....". Use your mouse wheel to zoom in on the recessed wall. Without clicking on the wall, try moving your cursor towards the wall, first from the bottom and then again from the top. Note how the side of the wall which you approach affects the swing direction of the door you are about to place. When the door appears, swinging into the building, press your space bar to see how it will flip the hinge side of the door before you place it. Shift the mouse back and forth to view the temporary dimensions showing the placement position of the door. When it is approximately in the middle of the wall, pick a point to place the door.
12. The Door command is still active and will allow you to place multiple doors by continuing to pick points along the walls. Add two more doors in the back wall, at the left and right corners. The doors should swing into the building and open against the adjacent wall. After you have added the third door, hit ESC twice to end the command.
13. From the Build panel on the Architecture tab of the Ribbon, select the Window tool. In the Type Selector, choose Fixed:24"x48". On the right hand side of the Ribbon, deselect the "Tag on Placement" option if it is enabled. We can easily tag the windows later if we wish to create a window schedule. Move your mouse over the wall to the left of the front door and click to place the first window approximately in the middle of the wall. Add three more of the same window type in this recessed section as shown on the handout. Try choosing the window position by picking the wall from the interior and exterior side and note that as with the doors previously, the side of the wall you select determines the side on which the window will be placed. Windows should be added from the exterior side of a wall.
14. With the window command still active, change the Type Selector to Fixed: 36"x48" and then place the remaining eleven windows as shown on the handout. The exact locations are not critical as we will place them accurately when we add dimensions in the next lesson.

15. With the window command still active, type WA to switch to the Wall command. Type DR to switch to the Door command. Type WN to switch to the Window command. Pick the Wall tool from the Build panel on the Home tab of the Ribbon. Selecting a new command, from either the Ribbon or with a keyboard shortcut, will cancel the previous command automatically. Set the Type Selector to Basic Wall: 4-7/8" Partition, and add the interior walls as shown on the handout. Set the location line to Finish Face Exterior, the height to Level 2, and clear the Chain option. This will allow you to add the interior walls one at a time.
16. While adding walls with a face location line, use the space bar to flip the orientation of the wall from left to right. This will be useful to help align the main north south interior walls with the inside face of the exterior walls.
17. Add the interior doors with the Single-Flush: 30x84 door type. Remember to use the Space bar to flip the doors as you insert them into the walls.
18. Type the shortcut CM or, from the Build panel on the Architecture tab, choose Component and in the type selector, choose Desk: 72"x36". Add a desk in each of the larger rooms. As you drag the desk into the rooms, the point at which it is attached to your cursor will be at the back corner of the desk. If you press the Space bar, it will rotate the component in 90 degree increments, allowing you to orient the desks against horizontal or vertical walls.
19. Type the shortcut RM or, from the Room & Area panel on the Ribbon, choose Room. Pick a point in the center of the lower left room of the floor plan to add your first Room. Continue to add Room Tags to all of the remaining rooms, selecting them in a clockwise direction around the building. Hit ESC or pick Modify on the Ribbon to end the room tag creation process.
20. To edit the names and numbers of the Rooms, select one of the room tags so the text is in blue. Pick the blue text and you will be able to type in the desired name or number. Edit all of the room names to match the handout.

21. Select one of the Room Tags, right-click and choose Select all Instances. With all of the Room Tags selected, reach into the Type Selector and change the Type to Room Tag: Room Tag with Area. All of the Room tags should now display the square foot area of each room.
22. From the Quick Access toolbar, choose the “Default 3D View” icon to switch to an isometric view of your first Revit building model. Still a work in progress, but not bad for 20 steps. 😊
23. Type SD to see a Shaded View of your model. Type HL to see a Hidden view. We’ll look at the view controls in more depth in the next lesson.
24. In the Project Browser, double click Level 1 to go back to the floor plan.
25. From the File menu, choose Saveas and save the project as Revit_1-1_XX where XX will be your initials. Backup your files to a removable drive. We will continue to develop this model in the level two class.

